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THE
ALBERTA
AGRICULTURAL
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Annual Report

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PROVINCE OF
ALBERTA

1968 - 1969

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INTRODUCTION

In a complex industry such as agriculture
in which many interlocking factors are involved,
it is very encouraging to see
the progressive and expanding response to the
Alberta Agricultural Research Trust.

Agricultural research requires finances,
research scientists, and facilities, plus a desire
to make improvements and solve problems.

With the fine co-operation of those in the
Faculty of Agriculture, University of Alberta, and
many in and associated with the food chain,
from the producer to the consumer,
the Trust has had another successful year in
its still early stage of development.

On behalf of the Board of Trustees, may I express
our sincere thanks to all who have been involved.

We trust that the research results will contribute
further to the agricultural progress in Alberta
and beyond this province.

A special reference should be made that
outside financial support has continued to increase,
for which the Board of Trustees is
greatly appreciative.

Our second annual report is herewith submitted.
May you find it interesting and of value.

E. E. Ballantyne, D.V.M., P.Ag., F.R.S.H.
Chairman, Board of Trustees

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COMPLETED PROJECTS — ABSTRACTS

AGRICULTURAL ENGINEERING

HARRISON, H. P.

Analysis of local weather data for grain and hay drying systems

An equation was developed which can be used to calculate the quantity of air (natural or tempered) required to dry either grain or hay. This figure is necessary in order to design an adequate drying system. Some of the input data is not readily available, particularly the entrance and exit humidity ratios. In view of this, a table was determined for small grains for the Edmonton area. The table is flexible in that different drying periods from August to November and of different duration can be selected. The quantity required for November is so large, however, that for practical purposes heat must be added.

Numerous drying experiments were conducted to check the validity of some of the underlying assumptions. The agreement between the actual and the calculated was reasonable and considered sufficient in view of the variability of the weather from the average.

HARRISON, H. P.

Effect of selected mechanical parameters on threshing efficiency

The effect of the main mechanical parameters of threshing (cylinder speed, concave clearance and feed rate) on threshability and kernel damage were determined. The results indicate that threshing is largely an impact process though the frictional process or model could not be dismissed. Threshability increased with cylinder speed and decreased with concave clearance. The opposite occurred for kernel damage. The optimum level of cylinder speed for minimum grain loss was found well below the recommended values of the combine manufacturers as used by many combine operators.

MacHARDY, F. V.

The effect of temperature on the keeping quality of tough and damp cereal grains

This research project was conducted under the direction of Professor J. B. McQuitty, Department of Agricultural Engineering.

Temperature, moisture and fungal population changes were determined in two dry and two tough wheat bulks stored in unventilated circular bins, each containing 41 bushels. The bins were subjected to a 28 day cooling period, followed by a 35 day warming period in a simulation of external temperature conditions. The factors influencing grain temperatures, moisture content and fungal populations included storage time, depth from the grain surface, radial distance from the centre of the bin, and the interaction between grain temperature, moisture content and fungal population.

Analysis of the data showed that temperature differentials are established in grain under the influence of external temperatures, the magnitude of the differentials being effected significantly by time, depth from the grain surface, radial distance and moisture content. Significant changes occur in the moisture content of the grain, arising from changes in grain temperatures, with migration and re-distribution towards the upper layers. Changes in moisture content in the radial direction were not significant. Significant differences in total fungal population occur for the main effects due to time, moisture content and genus, but variations in radial distribution were not significant. A higher *Penicillium* population appeared in the upper than in the lower layers in the stored wheat. *Aspergillus* did not show concentration in either layer. Above about 60° F grain temperature, fungi develop more readily in tough grain, leading to the creation of hot spots, than in dry grain. Tough grain may become completely spoiled in a short period without a pronounced temperature rise.

PRESTON, T. A.

Compilation of time

Studies of Alberta Dairy Farms were made using traditional time studies techniques. The results were compared with universal data from Holland, United Kingdom and U.S.A. A bulletin was prepared which includes considerable discussion of specific dairies and details of time standards obtained.

An analog computer device was developed for the assessment of overmilking. This was satisfactory but unfortunately the technician concerned left the University's employ. Partial development of an analog electronic timing system for dairy work was begun. This may be continued on the Grantee's return from sabbatical in Holland where similar work is to be studied.

ANIMAL SCIENCE

GRIEVE, C. M.

Effect of physiological growth stage at harvest on forage quality and nutrient productivity

Alfalfa-bromegrass was harvested as field-cured hay at four stages of maturity. Yields of dry matter and digestible dry matter respectively were 1505 and 1027 lb. per acre at the pre-bud stage of maturity, 1906 and 1414 lb. at the early-bud stage of maturity, 2820 and 1770 lb. at the mid-bloom stage of maturity and 3218 and 1583 lb. at the late-bloom stage of maturity of the alfalfa. Voluntary intake by sheep averaged 2.6, 3.4, 2.7 and 1.8 lb. dry matter daily; metabolizable energy values of the hay were 1.19, 1.31, 1.08 and 0.80 Mcal per lb. dry matter at each increasing stage of maturity. It was apparent that harvesting between the early-bud and mid-bloom stages of maturity would maximize nutrient yield and daily consumption of nutrients and increase the probability of a second cutting in the same year.

MILLIGAN, L. P.

Factors controlling urea utilization in the ruminant.

The urea transferred from the plasma to the digestive tract of fed sheep was quantitated employing ^{14}C-urea as a tracer, after establishing metabolic steady state. Plasma urea concentrations were manipulated by intravenous infusion of unlabelled urea. Recycled urea, within the physiological range of plasma urea concentrations fitted a linear function of plasma concentration. Recycling, in this study, of urea in different animals and for different rations, followed the relationship:

$$\hat{Y} = 0.117 + 0.37\,x, \quad (SE = 2.27;\; r = 0.85),$$

where $\hat{Y}$ = g urea recycled per day and x = plasma urea concentration (up to 45 mg/100 ml). A regression equation, incorporating data from other laboratories, that could be used for the general prediction of urea recycling in sheep from the plasma urea concentration was derived and was:

$$\hat{Y} = 1.61 + 0.31\,x, \quad (SE = 3.20;\; r = 0.77).$$

The ration did not appear to significantly influence urea recycling aside from influencing the plasma urea concentration. The urea recycled in fed sheep provided up to 30% as much nitrogen to the microbial population of the digestive tract as was available from the ration.

FOOD SCIENCE

JACKSON, H.

Studies on the significance of staphylococci in the manufacture of cheddar cheese

Certain strains of the bacterium *Staphylococcus aureus* have the ability, under certain circumstances, to produce toxins that cause food poisoning in man. Several outbreaks of staphylococcal food poisoning have been related to the consumption of dairy products containing the toxins. Until recently studies of the effects of environmental conditions on toxin production were severely limited because of elaborate and often unreliable tests for the detection of the toxin. However a rapid test has now been developed whereby the presence of toxins can be detected within 24 hours. For this reason it was decided to undertake a study of the elaboration of toxins during the cheddar cheese making process. A study was also made on the effects of pH and temperature on growth and toxin production. Several cheeses were made following the standard procedures employed in the manufacture of cheddar cheese. Toxigenic staphylococci were added at different stages during the manufacturing process.

The results show that if the pH of the cheese is normal, no toxin will be produced and the staphylococci will slowly die out. The significance of the survivors however cannot be underestimated. The use of such cheese in the preparation of other food products, in which the environmental conditions may be different, enabling the staphylococci to grow and produce toxin, presents a potential health hazard. Experiments using laboratory media confirmed the findings with the experimental cheese, namely that at pH levels below 6 growth and toxin production are limited.

It is concluded that toxin will not be formed in cheese made under normal conditions from milk containing enterotoxigenic staphylococci. Any factor that tends to raise the pH of cheese, such as slow starter or bacteriophage, may create conditions more suited to growth and toxin production by staphylococci. It is further concluded that the presence of enterotoxigenic staphylococci in cheese, even in large numbers, is not sufficient evidence per se to condemn the product as hazardous with respect to food poisoning. To condemn a product as a definite food poisoning hazard the presence of toxin must be unequivocably demonstrated. However, a product containing a large number of staphylococci could be justifiably condemned with reference to the general standards of hygiene expected in the food industry.

WOOD, F. W.

Carmelization defect of vacuum-packed sweet corn

The color defect was caused by the non-agitating batch process, common in Alberta canneries, in which the temperature and time are 250° F and 35 minutes. The other processing factors investigated, stage of maturity, corn variety and handling methods, particularly the storage of unprocessed corn in piles overnight, did not contribute to the development of the defect. The caramelized color was eliminated when experimental lots of corn were heat processed by rotating the cans end-over-end at 10 r.p.m. at a temperature of 250° F for 12 minutes.

PLANT SCIENCE

CORNS, W. G.

Shore vegetation control

The problem concerned control of perennial weeds, mainly Canada Thistle on uncropped saline shore area bordering farm land at Miquelon Lake bird sanctuary about 40 miles southeast of Edmonton. Agricultural and wild life conservation interests were involved. Seeded brome grass, tall wheatgrass, slender wheatgrass, reed canary grass, orchard grass, timothy, alfalfa and alsike clover were unsuccessful either when broadcast on the surface of uncultivated soil or when hand-raked into the surface of roto-tilled areas early in the spring. Cereal crops also could not grow well enough to provide cover and competition with weeds. However oats grew somewhat better than barley and both survived better than wheat or rye. Flowering and seed production of Canada Thistle were prevented without destroying the tall cover by sprays at very early bud stage of the weeds, with as little as 8 ounces of 2,4-D ester per acre or by only one quarter ounce of picloram (Tordon) per acre. Where the objective was to kill the thistles and allow a medium tall uniform cover of native foxtail barley and other grasses to become established, dosages of picloram of about 1 - 2 oz./A and grass competition, reduced the thistle cover by 90% or more within a year. Treatments of up to 6 lb. 2,4-D/A failed to prevent regrowth of Canada Thistles during the year after their top growth was killed. Ground spray applications were much more satisfactory than aircraft applications on narrow target areas.

VANDEN BORN, W. H.

Green foxtail: growth habits and control

Green foxtail seed exhibits seed dormancy upon maturing. A period of low temperature under moist conditions is required before seeds will germinate readily. Fall tillage practices should be aimed at allowing seeds to overcome dormancy. Seeds may germinate at any time during the growing season. Seedlings emerge readily from depths up to 8 cm, and may emerge from 12 cm below the surface. Early growth of seedlings is slow, and is sensitive to temperature and light intensity. At low temperature and light intensity growth takes place very slowly. This behaviour contributes to the low competitive efficiency of green foxtail in Alberta grain fields during most years. Usually green foxtail infestations must reach a density of 500-1000 plants per square meter before noticeable reductions in grain yield will occur. Chemical control of low density infestations, therefore, may be unwarranted financially unless future cropping seasons are included in the considerations. Plants grown from a seed sample collected in Manitoba grew more efficiently under low light than did Alberta plants, and showed much greater competitive efficiency. Some differences in growth patterns could be related to climatic factors. Plants grown from seed samples collected from thirty different sites in Alberta differed morphologically, but their response to herbicide treatments was similar. The latter observation is encouraging in that it removes at least one factor that could contribute to variability in effectiveness of herbicides used for green foxtail control in Alberta.

Greenhouse experiments with eight different herbicides yielded many suggestions for dosage and placement of soil-applied herbicides in the field. Unfortunately the inability to accurately control placement and soil variables in the field makes several of the successful greenhouse treatments impractical. MSMA, a foliar-applied organic arsenical, has shown excellent results in selective control of green foxtail, but may cause soil residue problems. Additional new herbicides are still under study.

VANDEN BORN, W. H.

Herbicide testing in field and greenhouse experiments

Work done under this project title was part of a continuous program of greenhouse and field trials aimed at finding means of more effectively using herbicides in a weed control program. A specific example here was a comparison of a variety of mixtures of MCPA and 2,4,5-T with a presently available similar mixture sold under the trade name 'Celatox', for the control of hemp-nettle in wheat or barley. The objective was to provide farmers with an effective alternative cheaper than 'Celatox'. The new mixtures controlled hemp-nettle as effectively and more cheaply than did 'Celatox', but they caused variable delays of maturity in wheat and barley. Another mixture, containing MCPA and mecoprop, provided excellent control, and holds promise for the future. Other phases of the program include control of Tartary buckwheat, green foxtail, wild oats, Canada Thistle, in grain and forage crops, and the evaluation of herbicides for total vegetation control.

SOIL SCIENCE

ROBERTSON, J. A.

Quality of barley grown with various fertilizers

This is part of a continuing Productivity-Economic project reported on later in this book. To date we have determined bushel weight, 1,000 kernel weight and % nitrogen for most of the barley (var. Gateway) samples collected from 1964 - 1968 inclusive. Also, percent legume in the forage sward, and % nitrogen in the forage species have been done on most of the forage samples from 1966 - 1968. Statistical analysis of these data are not yet done, but the following trends have been observed for the barley: 1) On soils containing high levels of available nitrogen, fertilizer nitrogen has little effect either on yield or on nitrogen content of the barley. 2) On soils with 40-60 lb of available nitrogen (top 24 inches), added nitrogen increases the nitrogen content of the barley from about 2.2 up to about 2.8 percent. 3) On soils with less than 30 lb of available nitrogen, added nitrogen increases barley nitrogen content from about 1.8 up to about 2.6 percent. 4) The highest nitrogen content of Gateway barley is about 2.8 percent. This value is considerably above that desired for malting barleys. Application of 60 lb N on soils with medium levels of available N, or of 120 lb N on soils low in available N, raises Gateway barley nitrogen levels above that desired for malting barleys.

ROBERTSON, J. A.

Nature of available phosphorus in Alberta soils

We requested funds to purchase equipment for radio isotope studies. Specifically, we are using P^{32} to help study the phosphorus status of Alberta soils. To date, one graduate student has done 4 experiments using P^{32}. These experiments provide some information on the available phosphorus in our soils and the soils' ability to fix phosphorus. The experiments provide standards against which various soil testing methods can be compared. The student hopes to complete his thesis in the spring of 1970.

The equipment is also available for other projects involving radio isotopes. Such projects may include further work on phosphorus or new studies with sulfur and carbon.

TOOGOOD, J. A.

The nutritive value of crops grown on a Grey Wooded soil

Forage samples were taken from several of the Breton plots. The plant species were sorted, dried, weighed and ground. The samples were analyzed for protein, cellulose and digestible cellulose. The following conclusions were drawn:

1. Fertilizers increased the grass content of the hay. 2. Highest yield of dry matter was from the NPS-Manure treatment. 3. Highest yields of crude protein and digestible cellulose were from the NPKS-Lime treatment. 4. All fertilizer treatments increased yield of dry matter, crude protein, and digestible cellulose, both in grasses and legumes. 5. Protein content of legumes was higher than that of grasses under comparable treatments or at comparable states of growth. 6. Percent protein in June for all species under all treatments was higher than in July. 7. Digestibility coefficients of cellulose were affected little by fertilizers or by stages of growth. The coefficients for the grasses were generally lower than for the legumes. Percent total cellulose showed similar trends.

CONTINUING GRANTS

AGRICULTURAL ECONOMICS

APEDAILE, L. P. *(3rd year of 4)*

Assessment of technical input/output relationships in Northern Alberta

The objective of compiling an input/output matrix is to provide the fundamental block of data necessary to regional development study in Northern Alberta. The more representative and complete the matrix, the more sensitive and useful will be policy recommendations for developing the agricultural sector in this relatively disadvantaged area of the province.

BERG, E. R. *(2nd year of 2)*

Hedging procedures in cattle feeding operations

Cattle-feeding is becoming more important; off-farm inputs are increasing, thereby increasing the risk of financial losses due to price changes of finished cattle. Hedging on futures markets, both of feed and finished cattle, is a possible solution for shifting risk due to price changes of feed costs and selling price of finished cattle.

LOVE, H. C., R. T. BERG, F. V. MacHARDY *(2nd year of 2)*

Cattle feeding in Alberta — a production economics study

The Alberta economy has many dynamic elements and agriculture is one of the most important. In no segment of agriculture is this more evident than in the rapid development of the cattle feeding industry in the postwar period. Significant expansion and important technological and structural changes have taken place especially during the past decade. The proposed interdisciplinary approach will increase the effectiveness of the study.

LOVE, H. C., D. K. McBEATH *(4th year of 4)*

The differential response of barley varieties to nitrogen and phosphorus fertilization and determination of economic optimum rates of application for each variety

The objective of this project is to define the relative response to nitrogen and phosphorus fertilizers of several barley varieties of importance to Alberta agriculture. Differences in the response to fertilizer can have two important implications for agriculture: 1) the evaluation of cereal varieties is conducted at only one level of soil fertility at any given location with the result that the ranking of a variety may be prejudiced if the soil fertility level is not optimum for that variety; 2) because fertilizer is a relatively costly production input in any farming program, a knowledge of varietal responses is necessary to ensure the efficient use of fertilizer nutrients.

HAWKINS, M. H., A. A. WARRACK *(4th year of 4)*

Livestock marketing practices: cattle marketing phase

To determine the procurement policies and practices of livestock buyers and agents in the terminal livestock markets, and of packing plant buyers. To determine how market price information is generated and communicated and how pricing decisions are made. To analyze the competitive structure of the market and appraise the performance of the livestock marketing system, with emphasis on the pricing mechanism and the role of non-price procurement factors on the performance of the market. Information on livestock marketing is needed in formation of Government policy and to assist producers and marketing agencies in improving marketing practices.

MANNING, T. W., W. M. SCHULTZ *(3rd year of 3)*

Farm trends and prospects in Alberta

The major objective is to determine the changing needs for and economies of size and location for local marketing facilities in Alberta. This information is needed for the improvement of marketing efficiency through a better adjustment of marketing facilities to the pattern of production.

PETERSEN, T. A., W. M. ROGERS *(3rd year of 3)*

Rate of farmer adoption of new technology as related to selected socioeconomic factors

In Alberta rural extension and continuing education programs, there has been a great deal of opinion and a number of interesting hypotheses concerning the social, economic, and psychological factors that affect the rate of adoption of new technology in agriculture, by farmers. The object of this project would be to test for the effects of these various factors with the aim of quantifying their importance and to arrive at suggestions for more effective extension methods for specific groups of farmers and situations. A further insight into the research-application lag would also be obtained, as well as the effect of rate of adoption on economic progress of farmers.

SCHULTZ, W. M. *(3rd year of 4)*

Farmers' managerial characteristics and farm success — a pilot study

The objective of this study is to determine some personal and farm organizational characteristics of farmers related to success or failure in farming. Empirical measures of success and of certain characteristics are taken and analyzed by means of regression and factor analysis. The results should aid in the development of extension programs specifically tailored to the low income segment of agriculture.

WARRACK, A. A., M. H. HAWKINS *(2nd year of 3)*

A study of least-cost alternatives for assembly of Alberta hogs

The objective of the project is to analyze hog assembly alternatives and solve for the least-cost (most efficient) industry organization and operative procedure. Timing is critical — a change in the hog marketing procedures is likely and a research base for future decisions is essential. The outline of this project is toward the future; hog producers have voted for a Hog Marketing Board. The suggested marketing procedure changes are proposed to facilitate improvements in pricing and assembly efficiencies. The industry has suggested the special need for this research.

AGRICULTURAL ENGINEERING

HARRISON, H. P. *2nd year of 2)*

Effect of traffic compaction on the cultural practice of zero tillage

The project is to determine to what extent frost action will prevent traffic compaction increasing to detrimental levels with a zero tillage practice.

McQUITTY, J. B. *(4th year of 6)*

Effects of aeration and temperature on the composition and odours of slurry from intensively housed cattle

The objectives are to study the effects of aeration and temperature on the physical and chemical composition, including odour, of cattle slurry. The removal of cattle slurry from collection tanks below slatted floors at present involves dilution with water and agitation prior to emptying. This increases the volume of material to be handled and requires the use of expensive equipment. Distribution gives rise to offensive odours.

PRESTON, T. A. *(2nd year of 2)*

Potato harvester damage studies

Determinations will be made of yield in field. Parent tuber location in drill in relation to the harvester blade, machinery speed, soil temperature, moisture, and all other relevant aspects such as top till, variety, etc. Records will be kept. Assessment of damage will be made by the paracresol method, classifying by depth of stain to three grades of severity of damage. By selecting speeds and depth of harvester operation it is hoped to be able to identify the relationship between methods of operation and damage susceptibility.

STEPHANSON, B. T. *(3rd year of 3)*

Analysis of Alberta tractor accident statistics

The objective is to quantify the factors contributing significantly to highway fatalities involving farm tractors.

STEPHANSON, B. T. *(2nd year of 2)*

Farm tractor repair costs and comparison of cost of operation of diesel, gasoline and L.P.-gas tractors

Repair costs are an important part of the total cost of owning and operating a farm tractor and these costs influence many farmers' decisions on the type of tractor to buy. While the comparison of repair cost rates between diesel and gasoline tractors has been quite well documented the place of L.P.-gas tractors has not been fixed. Alberta is a logical place for determining the relationship which will allow intelligent decisions to be made with respect to the use of L.P.-gas tractors.

ANIMAL SCIENCE

BERG, R. T. *(3rd year of 3)*

Genetic effects on carcass composition in swine

To determine objectively the proportions of lean, fat and bone in swine carcasses and to relate these findings to commercial values. To study genetical (breed and sex) and environmental (plane of nutrition) influences on carcass composition in swine. From these studies it should be possible to devise recommended breeding and management practices for the production of carcasses of superior composition.

BOWLAND, J. P. *(4th year of 5)*

Graduated levels of rapeseed meal for gilts to be used for reproduction

To evaluate the utilization of solvent-extracted rapeseed meal, at levels between 3 and 8% of the total diet, for gilts that are to be used for reproduction. There is a reluctance at present of swine producers to use any rapeseed meal in reproduction diets. Feed manufacturers also resist use of the meal as they are not sure as to what level may be incorporated safely in reproduction diets for swine.

CLANDININ, D. R. *(3rd year of 3)*

Feeding value of solvent-processed rapeseed meal for laying and breeding chickens and turkeys

The objective of this study is to determine whether or not solvent-processed rapeseed meal may replace soybean meal in rations for laying and breeding chickens and turkeys without adverse effects on productive and reproductive traits. This study is important to Agriculture since the future of rapeseed production in Canada appears to depend on whether or not export outlets for rapeseed can be expanded and whether or not domestic uses for rapeseed oil and rapeseed meal can be developed.

CLANDININ, D. R. *(1st year of 3)*

Factors affecting the feeding value of rapeseed meal

The initial objective of this project is to determine the effects that processing variables, which obtain at the five Canadian rapeseed processing plants, have on the composition, metabolizable energy content and growth promoting value of rapeseed meal produced in these plants. In addition, it is the intention to study factors affecting the metabolizable energy value of rapeseed and to devise, if possible, methods for improving the metabolizable energy value of rapeseed meal.

COMBS, W. *(3rd year of 5 +)*

Recombination of quantitative traits in sheep

This project is designed to study genetic problems basic to the development of new breeds from combinations of diverse stocks. The Lincoln and Southdown were chosen not because of their potential for forming a new breed but because their contrasting physical characteristics seemed to make them best fit for studying this problem.

GRIEVE, C. M. *(3rd year of 5 +)*

Forage evaluation in relation to animal productivity

Increased efficiency by livestock producers necessitates higher production of forage and skilled management. This project is designed to evaluate forages in relation to ruminant animal productivity; two legumes are included for comparison with alfalfa because of their non-bloating character and lack of data in this area. Cereals are included since these may outyield our common forage grasses and legumes. Results should be of particular interest to dairymen, but of interest to beef cattle producers as well.

HARDIN, R. T. *(2nd year of 2)*

Genetic effects on body composition in poultry

To evaluate the importance of genotype (breed, sire and dam) on the relative growth of muscle and bone and on the deposition of fat in poultry. To study the effect of genetic-nutritional relationships on carcass composition. To relate carcass composition to market demands. The study should assist the producer in more efficiently meeting consumer demands for high quality poultry.

MILLIGAN, L. P. *(2nd year of 3)*

Studies of the metabolism of nitrogenous compounds in ruminants. Development of non-protein nitrogen sources for, and methionine metabolism in, ruminants

It is intended to obtain quantitative measures of the metabolism of methionine, which may be a limiting amino acid, in sheep and to evaluate the extent to which encapsulated methionine, which may soon be on the market, is actually available to ruminants. It is also intended to develop non-protein nitrogen (NPN) supplements for ruminants which, in contrast to urea, give rise to ammonia production in the rumen at a rate that is compatible with the rate of microbial protein synthesis, thus resulting in more efficient usage of dietary supplementary nitrogen than is now achieved with urea and circumventing dangers of ammonia toxicity. Greater usage of NPN at the expense of protein in rations for ruminants would be less expensive and would reduce competition for food between ruminants and humans.

NIELSEN, N. O. *(2nd year of 5 +)*

Pathogenesis of enteric colibacillosis in the newborn pig

Enteric colibacillosis is one of the leading causes of diarrheal disease in newborn pigs in North America. A long-term project is planned to study the mechanism whereby certain strains of *Escherichia coli* cause diarrheal disease in newborn pigs. Assuming success here, later research based upon this knowledge will be proposed to study methods of prevention.

ROBBLEE, A. R. *(4th year of 5 +)*

Studies on hock disorder in turkey poults

Each year, losses are suffered by turkey producers in Alberta from a syndrome in poults characterized by hock disorder, broken feathers, dermatitis and diarrhoea. The syndrome appears sporadically and thus methods of prevention are difficult to achieve. The addition of biotin to starting rations for turkeys has been shown to be fairly effective in controlling the disorder but biotin does not entirely prevent its occurrence. The objective of the research proposed is to try to develop methods of preventing the occurrence of the syndrome.

WEBSTER, A. J. F. *(4th year of 5 +)*

Quantitative studies on the environmental physiology of ruminants

The next phase of this continuing project will study the direct responses of young beef cattle to winter conditions in Alberta. This involves measurement of absolute cold tolerance, breed and strain differences in cold tolerance, physiological adaptation to cold and winter feed requirements. Such studies have direct practical implications with regard to winter management of beef cattle in Alberta.

ENTOMOLOGY

GOODING, R. H. *(4th year of 4)*

A study of the insect predators of some cutworm species

The extensive use of insecticides in the control of agricultural pests has often met with two obstacles: the development of insecticide resistance in the pest species and the destruction of useful insects, often including parasites or predators of the pest species. A study is proposed of the predation upon one or more species of cutworms to determine: the insect predators of these pests; the quantitative contribution of predation to the mortality of the cutworm larvae and pupae; alernative food sources of the predators; the relative insecticide susceptibility of the cutworm species and their major predators. The results of this study may lead to methods for biological control of the cutworms and should produce recommendations for insecticide use which would have minimal effects upon the predator populations.

HOCKING, B. *(4th year of 4)*

An assessment of the pesticide residue situation in an urban milieu

To obtain quantitative data on the long term persistence and translocation of chlorinated hydrocarbon insecticides, especially DDT, in the soil. The results will permit future advice to city authorities and to agriculturists elsewhere concerning insecticide use to be based on knowledge instead of guesswork.

HOCKING, B. *(4th year of 5)*

The influence of mutagenic radiation on the development of insecticide resistance

Interest in this question is too broad to be of specific concern to any particular potential contributor except perhaps the pesticide industry and pest control operators. It should, however, be of general concern to all contributors. It is proposed to conduct the work co-operatively with the Department of Genetics.

HOCKING, B. *(3rd year of 5 +)*

Mosquito studies in Edmonton area

A study of those aspects of mosquito life cycles, behaviour, dispersal, general ecology and control which may be of use in evaluating the mosquito problems and the mosquito control program in the Edmonton area. In addition to its value to the City and the adjoining rural areas, this work will provide the basis for recommendations to rural communities and municipalities throughout the Province.

FOOD SCIENCE

ARMSTRONG, J. G. *(3rd year of 5 +)*

Improvements in dairy products processing

The objective is to increase the quality of dairy products offered in retail stores and to improve the efficiency of Alberta dairy products processing. The farm value of Alberta milk production is over $60,000,000 annually and the factory value of dairy products is over $65,000,000, approximately one-third of which is in creamery butter. With increasing prices, high quality is of paramount importance if these products are to retain their share of the food market and continue to provide a significant source of income for Alberta farmers.

ARMSTRONG, J. G. *(2nd year of 5 +)*

Quality studies on Alberta potatoes

Alberta's annual potato crop amounts to over 300 million pounds and returns over $9 million to the growers. It is sold in fresh and processed forms on domestic and export markets but it is difficult to maintain the high quality standards expected today in most markets. This project is intended to provide technical service to potato growers and processors for the improvement of product quality through research on a number of problems affecting both fresh and processed potatoes.

CLEGG, L. F. L., F. W. WOOD *(2nd year of 2)*

Improving cream quality

More than half of Alberta's milk production goes into the manufacture of butter, which when production is high, is exported to other provinces. Butter quality is largely dependent on cream quality and there is much room for improvement here. The Food and Drug Directorate is becoming increasingly anxious about extraneous matter in butter and methods to achieve an "automatic" improvement in cream (and hence butter) quality are necessary because the widespread distribution of cream producers makes advisory work among them difficult.

JACKSON, H. *(2nd year of 3)*

Modification (microbiological & enzymatic) of seed proteins for human consumption

Oil seeds and oilseed residues are rich in protein and as such have a great potential for supplying the protein needs of an ever increasing world population. The objective for this work is the development of methods and processes whereby oilseed protein may be incorporated in the human diet.

PLANT SCIENCE

ANDREW, W. T. *(4th year of 5 +)*

Vegetable variety trials

To compare the adaptability of newer vegetable cultivars to those presently being grown in this area. Emphasis will be placed on those vegetables grown commercially as it is essential on a competitive market to produce the best cultivars available. Results will also be available for extension programs and publications involving home gardeners.

ANDREW, W. T., W. P. SKOROPAD, T. A. PRESTON *(2nd year of 3)*

Factors affecting plant stands in potatoes

To continue the investigations of what biological and/or mechanical factors may be responsible for the great variation in plant stands in Alberta potato fields. The value of good cultural practices e.g. fertilizing, pest control and careful harvesting is being drastically reduced in many fields by poor plant stands.

ANDREW, W. T. *(2nd year of 2)*

Potato nutrition studies

To obtain further information on optimum levels of Nitrogen, Phosphorous and Potassium for the production of optimum yield and optimum quality of potatoes. To provide potatoes grown at different nutrient levels for quality determination studies by the Department of Food Science.

ANDREW, W. T., P. D. HARGRAVE *(2nd year of 2)*

Chemical vine killing of potato

To determine whether potato tops can be killed with chemicals that are effective, economical and do not leave residues toxic to human beings or animals. To determine optimum rate, time, and number of applications and optimum application techniques. To study the effect of vine killing chemicals on the storage, culinary quality and chemical characteristics of the treated potatoes.

BAILEY, A. W. *(3rd year of 5 +)*

Range improvement and forage production in the parkland area

There is need for a greater forage supply to provide for the expanding beef cattle industry in Alberta. This project has the objectives of finding ways to increase production and utilization of native grasslands and permanent pastures in the parkland area of the province.

COLOTELO, N. *(3rd year of 3)*

Effect of crop residues on developing Sclerotinia *species*

To determine the effect(s) of crop residues on the development of mycelium from sclerotia of *Sclerotinia* species. Inoculum in the form of sclerotia overwinter or survive long periods of adverse conditions, develop mycelium and infect crops such as red clover, cereals, rape, flax, sunflowers, as well as root crops kept under low temperature storage. Results of these residue tests may provide information regarding cropping and storage precautions.

HIRUKI, C. *(3rd year of 5 +)*

Potato viruses, virus diseases, and their control

The objectives of this project are to identify the potato viruses, to investigate the methods of their transmission, and particularly to develop the practical and efficient techniques of detecting viruses in seedling potato lines. Such techniques will not only simplify the present procedures of potato tuber indexing, but also make them more reliable and ultimately reduce the serious problems of virus diseases in potato production.

KNOWLES, R. H. *(4th year of 4)*

The effect of light quality and temperature on the germination of seeds of woody plants

The germination of seed of woody plants is usually unpredictable and frequently characterized by poor, less than 50%, germination. In other instances seeds of the same species, harvested at the same time from different locales behave quite differently in their germinative response. Our major objective is to find out more about some of the underlying reasons for poor germination. While these may have specific application, it is not improbable to think that they may have broader implications.

SMITH, W. E. *(4th year of 5 +)*

Applied genetical research leading to the improvement of barley, flax, wheat

The objectives are to make long term studies leading to the improvement of varieties. Such studies will include research on the inheritance and phenotypic expression of the economical characters, yield, maturity, reaction to diseases, quality and lodging resistance.

TOOP, E. W. *(4th year of 5 +)*

Relationship of temperature and mineral nutrition to carbon dioxide enrichment

To investigate the demand for mineral nutrients of a given crop plant under varying levels of CO_2 with controlled conditions of temperature and light. To investigate this demand for mineral nutrients over a range of specific CO_2 concentrations with varying temperature and controlled light conditions. Carbon dioxide enrichment is being used by more and more greenhouse operators in Alberta but little is yet known about the relationship of CO_2 concentration to mineral nutrition and temperature in the forcing of greenhouse crops; consequently the expected increase in yield with CO_2 enrichment does not always materialize.

ZALIK, S. *(3rd year of 4)*

Studies on lipids and nucleic acids of cereal seeds and seedlings

To study changes in the lipid components of winter wheat and winter rye embryos during vernalization. The basic objective is to find the mechanism or factors which control the vernalization response. This information would be useful to plant breeders in breeding for earliness and hardiness. Moreover, it has the possibility of direct agricultural application in terms of a potential induction treatment to certain crops.

SOIL SCIENCE

PLUTH, D. J. *(2nd year of 3)*

Productivity ratings for soil types in Edson and Whitecourt map areas

The inherent productivity of soil type will be determined mainly from the interpretation of soil morphology in land areas now considered marginal and sub-marginal for agricultural use. The objective: to relate quantitative parameters of soil morphology and physiographic site to forest productivity measured by mean annual increment of wood. A relative rating of soil types for agricultural crops is derived from their forest productivity rating.

ROBERTSON, J. A., S. DUBETZ *(2nd year of 2)*

Potato irrigation experiment

To determine irrigation requirements for optimum potato yields. To demonstrate the effects of three irrigation practices on potatoes. To provide information concerning irrigation practices that will enable growers to optimize their potato production.

TOOGOOD, J. A. *(3rd year of 3)*

Computer applications of soil test data from A.S.F.T.L.

To complete keypunching of A.S.F.T.L. 1956 - 1967 data and place this on IBM tapes. To develop programs for computer analysis of data. To increase the value of fertilizer recommendations by the A.S.F.T.L. by having more accurate bases for comparing soil test data.

TOOGOOD, J. A., F. D. COOK *(2nd year of 2)*

Pipeline and petroleum effects on soils

I wish to supplement data gathered in 1966 and 1968 on effect of pipeline installations on crop yields. I wish to follow up field and greenhouse studies, begun in 1968 on effect of additions of crude oil to soils, in an effort to determine the critical levels of oil that cause damage to soils and to discover the perseverance of this damage.

WEBSTER, G. R., J. A. ROBERTSON, H. C. LOVE *(4th year of 5 +)*

Crop yield and quality on certain "Bench Mark" soils as related to environmental and soil variables; determination of economic optima

To derive yield equations relating crop yield to a number of variables including available nutrients in the soil, fertilizer nutrients added, certain environmental factors. To determine the optimum rates of fertilization using equation derived above. To evaluate the effects of the variables on crop quality. This information is urgently needed so recommendations can be made more precise and to provide research data for the rapidly expanding soil testing program.

NEW GRANTS
EFFECTIVE 1969

AGRICULTURAL ECONOMICS

LOVE, H. C. *(3 yrs.)*

Projection of Agricultural credit needs in Alberta—1980

Longer term projections will make possible a less foggy picture of the future environment of farming that will aid in anticipating financial problems as well as many other policy problems. Rather than concentrating on outright prediction — projections will consider alternative contingencies. The study will build on present outlook work. Assumptions as to the changes in type of farming and technology may largely determine the asset side. The structures of liabilities will depend in part on 1) the relative importance of different credit institutions, and 2) how general credit conditions affect the supply of credit. Income and savings of farmers between the present and the period of projection will influence the balance sheet.

PETERSEN, T. A., M. H. HAWKINS (1 yr.)

A statistical analysis of hail suppression results in Alberta

To evaluate hail suppression programs in Alberta, using statistical inference techniques. Thus, through the use of standard, well recognized tests, it can be determined whether the effects of cloud seeking are statistically significant or whether the results to date are due to chance alone. The results will supplement the findings of the Alberta Research Council in hail research, and provide information for use in further agricultural weather modification projects.

ANIMAL SCIENCE

BOWLAND, J. P. *(2 yrs.)*

Determination of digestible and metabolizable energy in the diets of swine fed rapeseed meal

To obtain digestible and metabolizable energy values for a series of rapeseed meal samples. Protein digestibility and retention will be studied for these same samples when fed to pigs. Very limited energy data are available with pigs and this is a major limiting factor in the use of rapeseed meal by feed manufacturers as they have no reliable values to use in their formulations.

ROBBLEE, A. R. *(1 yr.)*

Effects of Nitrovin on the growth and feed efficiency of broiler chickens

It has been claimed that nitrovin improved rate of growth and feed efficiency in chickens. The possibility of using this compound as a growth promotant is intriguing because it apparently exerts no worthwhile activity against micro-organisms and has no therapeutic value in the treatment of disease in man or animals. Thus the problem of resistant organisms developing does not exist. The objective of the project is to investigate the use of nitrovin in rations for broilers.

YOUNG, B. A. *(5 + yr.)*

Studies on the energy expenditure and dietary energy requirements of ruminants

The object of the project is to measure the rates of energy expenditure of ruminant animals under grazing and other management conditions and to determine the effect of environmental, nutritional and physiological factors on the rates of energy expenditure. This information will provide a basis for the estimation of the dietary energy requirements of cattle and sheep kept in various management situations.

ENTOMOLOGY

CRAIG, D. A. *(2 yrs.)*

The life history of Simulium arcticum *in relation to its control*

Because of loss of productivity in cattle from attacks by blackflies (Simulium arcticum) farmers in the area West of Athabasca township have asked the Alberta Agriculture Department, Pest Control Division to start control procedures against these flies. However, little is known about the life history of this simuliid which breeds in the Athabasca River. It is proposed to investigate the life history to determine the most appropriate time for the application of control measures, and also to test some of the larvicides that might be used.

FOOD SCIENCE

WOOD, F. W., F. H. WOLFE (2 yrs.)

The processing of Saskatoon berries

In this research information has been obtained on the yield and general acceptability of this fruit but no information is available on the content of vitamins, sugars, flavoring compounds, pigments and other important chemical constituents. Such information is necessary in order to assess the potentialities of this fruit for commercial and home processing.

PLANT SCIENCE

ANDREW, W. T. *(3 yrs.)*

Sweet corn cultural project

To significantly improve yield and quality of processing sweet corn. Present yields do not supply returns to growers that are sufficiently competitive with other crops. Improvements in sweet corn production should substantially strengthen the vegetable processing industry in Alberta.

COLOTELO, N. *(1 yr.)*

Effect of selective fungicides on snow mold pathogens

To evaluate selective fungicides in controlling snow mold pathogens and to determine the mode of action of these fungicides.

CORNS, W. G. *(2 yrs.)*

Shore vegetation control

Now that our Miquelon Lake project is nearing completion and will be summarized shortly, it is proposed to concentrate on a different aspect of shore vegetation control noted in last year's application viz. Continuation of a study on control of cat-tails and other species which tend to obstruct sewage lagoons. These are frequently on agricultural land which received spill-off. Emphasis will be on the feasibility of use of herbicides as a substitute for mechanical methods of control.

KNOWLES, R. H. *(2 yrs.)*

Evaluation of the behaviour of turf grass species and varieties to variations in management practise

A considerable number of turf grasses, hitherto untried in Alberta, are now available for evaluation. Two of these, the creeping timothies, and some of the newer strains of *Poa* that are said to be tolerant of low mowing are of particular interest. The reported tolerances of these two may make it possible for them to survive under those rigid conditions imposed by certain accepted maintenance standards, particularly on golf course fairways, that seriously affect the survival of Kentucky Bluegrass.

PHAN, C. T. *(3 yrs.)*

Elaboration of conditions of storage to provide quality vegetables to Alberta markets

Research for improved storage conditions of root crops, principally carrots, and possibly other vegetables (cabbage), in order to provide quality products for Alberta consumers.

TOOP, E. W. *(1 yr.)*

Magnesium deficiency in greenhouse tomatoes — correlation of soil analyses with foliar analyses

The objective of this project is to investigate the causes of magnesium deficiency symptoms which are showing up in greenhouse tomato crops in the Medicine Hat area. Applications of magnesium salts to these crops has not proven successful. Finding a means of overcoming this problem would prove of great benefit to these growers of tomatoes and cucumbers — higher yields and better quality.

VANDEN BORN, W. H. (2 yrs.)

Effects of 2-chloroethane phosphonic acid on herbicide translocation

ACP 66-329 (2-chloroethane phosphonic acid) has a variety of effects on plant growth, one of which is the stimulation of growth of dormant buds. If underground buds of perennial weeds can be so stimulated, downward translocation of foliar-applied herbicides should be increased, and herbicidal efficiency in eradicating such perennial weeds should be improved. Pretreatment with this chemical or its addition to spray solutions may then result in lower required dosages of expensive herbicides, and a less serious soil residue problem.

SOIL SCIENCE

COOK, F. D. (1 yr.)

Urea hydrolysis in Alberta soils

Urea is manufactured by most fertilizer companies and marketed as a high nitrogen carrier. Although widely used as a nitrogen fertilizer very little is known about the rate of urea hydrolysis in soils of the temperate region. Hydrolysis rates are important because the conversion urea to ammonium carbonate is involved with loss of nitrogen as free ammonia from soil, as well as toxicity of seedlings when urea is drilled with seed. A better understanding of the fate of urea in our soils will enable more realistic use of urea for agronomic purposes.

COOK, F. D. (1 yr.)

Agricultural use of ammoniated sulfomethylated humic acids

Ammoniated sulfomethylated humic acids (ASHA), is a product made from Alberta coal by a process developed by the Alberta Research Council. It contains the plant nutrients nitrogen (up to 14%) and sulfur (about 3%), but in addition it contains organic material and may serve as an amendment for soils low in organic matter. The objective of this project is: (1) to find if ASHA has properties as a nitrogen-sulfur fertilizer or as a soil amendment that warrants its use in agriculture; (2) to investigate surfactant properties as a possible fungicide, bactericide, or herbicide carrier.

NYBORG, M. P. K. (2 yrs.)

Computer applications of soil test data from A.S.F.T.L.

To develop additional programs for computer analysis of data; and to increase the value of general fertilizer recommendations and of fertilizer recommendations made by the A.S.F.T.L., through relating soil test values to soil characteristics and soil survey information.

ALBERTA AGRICULTURAL RESEARCH TRUST

STATEMENT OF CONTRIBUTIONS, INCOME AND DISBURSEMENTS

		CUMULATIVE TOTALS
	September 1, 1968 to August 31, 1969	April 1, 1966 to August 31, 1969
CONTRIBUTIONS:		
GOVERNMENT OF ALBERTA	100,000.00	800,000.00
INDUSTRY*	68,347.81	152,568.09
TOTAL CONTRIBUTIONS	168,347.81	952,568.09
INVESTMENT INCOME	22,838.58	71,982.72
TOTAL FUNDS AVAILABLE	191,186.39	1,024,550.81
UNALLOCATED CASH ON HAND	20,084.00	117,922.41
FUNDS ALLOCATED FOR RESEARCH	171,102.39	806,628.40
FUNDS ALLOCATED AND/OR SPENT ON RESEARCH-IN-PROGRESS (See Schedule I)	171,102.39	811,687.99
FUNDS SPENT ON COMPLETED RESEARCH		94,940.41

SCHEDULE I

FUNDS ALLOCATED AND/OR SPENT ON RESEARCH-IN-PROGRESS

FUNDS ON SHORT-TERM INVESTMENT ..	250,000.00
FUNDS ON DEPOSIT IN INDIVIDUAL GRANTEES' ACCOUNTS	43,824.27
FUNDS SPENT ON RESEARCH IN PROGRESS	458,170.23
ADMINISTRATIVE COST (Accumulated) ..	59,693.49
	811,687.99

* See Names of Contributors, Last Page.

CONTRIBUTIONS

from sources listed
are gratefully acknowledged
September 1, 1968 - August 31, 1969

Alberta Dairymen's Association

Alberta Potato Commission

Alberta Vegetable Marketing Board

Canadian Lacombe Hog Breeders Association

Canadian Utilities, Limited

City of Edmonton, Parks & Recreation Department

Cyanamid of Canada Limited

Delmar Chemicals Limited

Golden Arrow Manufacturing Limited

Imperial Oil Limited

Ontario Seed Cleaners and Dealers

Rapeseed Association of Canada

Ryan, A.

United Grain Growers Limited

Western Cooperative Fertilizers Limited

TOTAL $68,347.81

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